

## **U.S. Department of Energy**

Oakland Operations Office, Oakland, California

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### **FINAL ACTION MEMORANDUM FOR THE WESTERN AND EASTERN DOG PENS**

at the

**LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH  
UNIVERSITY OF CALIFORNIA, DAVIS**

*Prepared for*

**United States Department of Energy**  
Oakland Operations Office  
1301 Clay Street  
Oakland, California 94612-5208

*Prepared by*

**Weiss Associates**  
5801 Christie Avenue  
Emeryville, California 94608-1827

April 6, 2001  
Rev. 0

DOE Oakland Operations Contract DE-AC03-96SF20686

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Figure 2-1. Location of Western and Eastern Dog Pens, LEHR Site, UC Davis, California

## ACRONYMS AND ABBREVIATIONS

|         |  |
|---------|--|
| AEC     | Atomic Energy Commission (now the Department of Energy)              |
| ARAR    | Applicable or Relevant and Appropriate Requirement                   |
| ATSDR   | Agency for Toxic Substances and Disease Registry                     |
| CERCLA  | Comprehensive Environmental Response, Compensation and Liability Act |
| CFR     | Code of Federal Regulations  |
| COPCs   | contaminants of potential concern                                    |
| cu yd   | cubic yard   |
| CVRWQCB | Central Valley Regional Water Quality Control Board                  |
| DOE     | U.S. Department of Energy  |
| EDPs    | Eastern Dog Pens   |
| EE/CA   | Engineering Evaluation/Cost Analysis                                 |
| EPA     | U.S. Environmental Protection Agency                                 |
| FFA     | Federal Facility Agreement   |
| ft      | feet   |
| HI      | Hazard Index   |
| ITEH    | Institute for Toxicology and Environmental Health                    |
| LEHR    | Laboratory for Energy-Related Health Research                        |
| LLW     | Low-Level Waste  |
| MCL     | maximum contaminant level  |
| MOA     | Memorandum of Agreement  |
| NCP     | National Oil and Hazardous Substances Pollution Contingency Plan     |
| NEPA    | National Environmental Policy Act                                    |
| NPL     | National Priorities List   |
| pCi/g   | picocuries per gram  |
| PRP     | Potentially Responsible Party  |
| RA      | removal action   |

|          |                                 |
|----------|---------------------------------|
| Ra-226   | radium-226                      |
| RAO      | removal action objective        |
| RBAS     | risk-based action standard      |
| ROD      | Record of Decision              |
| Sr-90    | strontium-90                    |
| UC Davis | University of California, Davis |
| WDPs     | Western Dog Pens                |
| μCi      | microCuries                     |
| μCi/yr   | microCuries per year            |



## 1. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the proposed non-time-critical removal actions (RAs) described herein for the former Laboratory for Energy-Related Health Research (LEHR) (the Site) Federal facility located at the University of California, Davis (UC Davis) in Solano County, California (Figure 1-1).

The proposed RAs will be executed by the U.S. Department of Energy (DOE) in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act and as governed by the Federal Facility Agreement (FFA) Under CERCLA Section 120, In the Matter of The U.S. Department of Energy, Laboratory for Energy-Related Health Research, Administrative Docket Number 99-17 (EPA, Region 9, et. al). As a Federal facility, LEHR is under the jurisdiction of DOE, who acts as the lead agency in carrying out CERCLA remediation activities (CERCLA, §120). The proposed RAs meet the criteria for a non-time-critical RA under the National Oil and Hazardous Substances Contingency Plan (NCP) as described in 40 Code of Federal Regulations (CFR), Section 300.415, and will be performed under the authority of Executive Order 12580. The EPA, the California Department of Toxic Substances Control (DTSC), the California Department of Health Services (DHS), and the Central Valley Regional Water Quality Control Board (CVRWQCB) have reviewed the proposed RAs in the EE/CA and have agreed with DOE's remediation approach.

This document was prepared in accordance with DOE and U.S. Environmental Protection Agency (EPA) Guidance (DOE, 1994 and EPA, 1993).

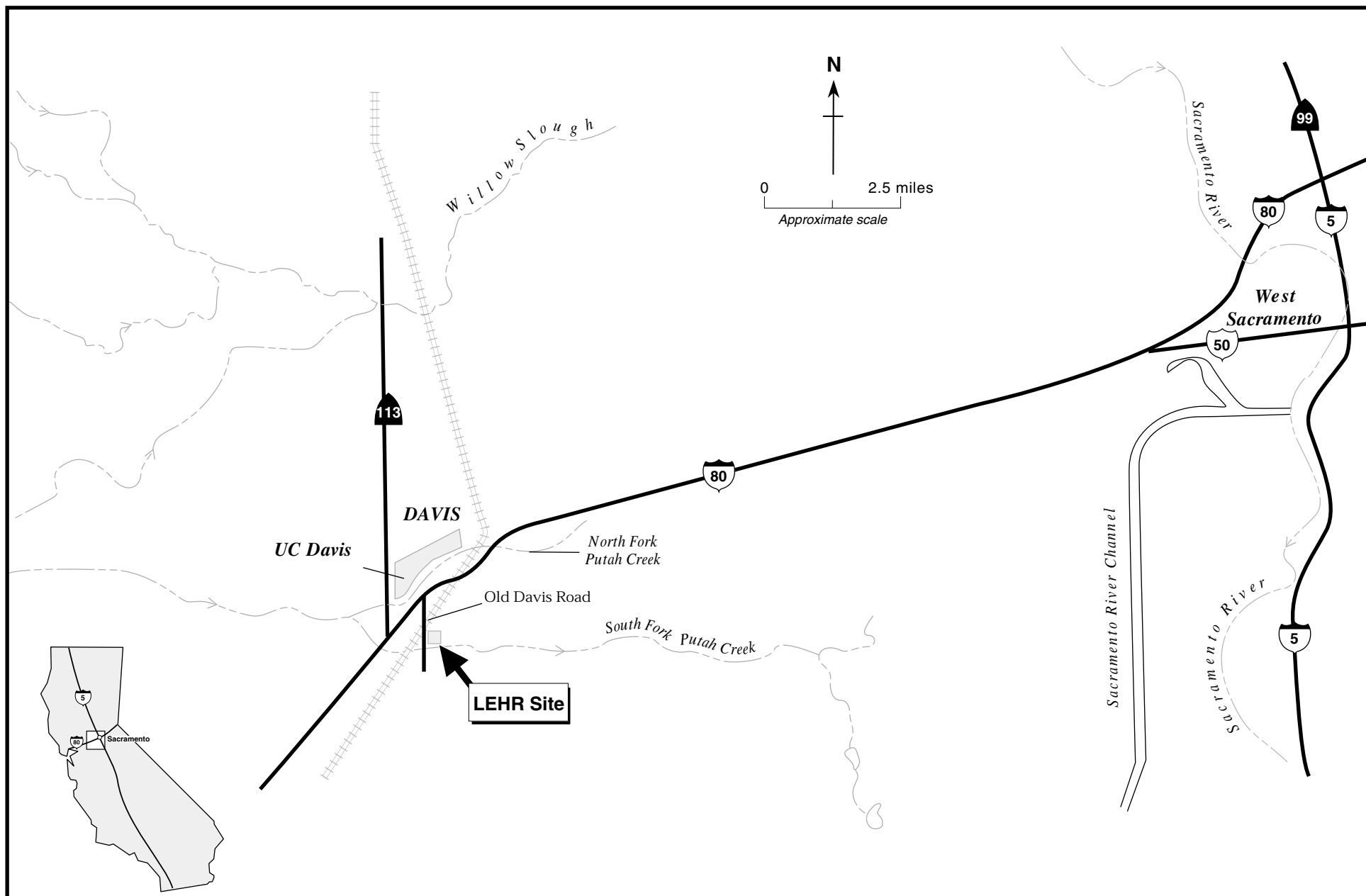


Figure 1-1. Location of the LEHR Site, UC Davis, California

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## 2. SITE CONDITIONS AND BACKGROUND

This Action Memorandum is for non-time-critical RAs that address potentially contaminated gravel, asphalt, and concrete in the Western and Eastern Dog Pens at the LEHR Site (Figure 2-1). The CERCLA Information System identification number for the Site is 0904786. The information presented herein summarizes the data available in the *Draft Final Engineering Evaluation and Cost Analysis* (EE/CA) (WA, 2000b) and the *Final Site Characterization Summary Report for the U.S. Department of Energy Areas at the Laboratory for Energy-Related Health Research* (WA, 1997a).

### 2.1 Site Description

The Atomic Energy Commission (AEC, now DOE) began conducting radiological studies on laboratory animals, primarily beagles, in the early 1950s at UC Davis. Initial studies were carried out on the main UC Davis campus and involved administration of radioactive materials to the beagles. In 1958, the project was moved to its present location and began operating full-scale radiological experiments. Research through the mid-1980s focused on the health effects from chronic exposure to radioactive materials, primarily strontium-90 (Sr-90) and radium-226 (Ra-226). The beagles, after being fed/injected with radioactive materials and held indoors for a 30-day period, were housed outside in dog pens which occupy approximately 20% (three acres) of the Site.

There were two separate dog pen locations at the LEHR site, now referred to as the Western Dog Pens (WDPs) and Eastern Dog Pens (EDPs). The outside pens were constructed with a fence set in a concrete-curb foundation, a gravel-lined floor, and a 55-gallon drum set on a concrete pedestal which served as shelter for the dog. Currently, 256 pens remain in the WDPs and 96 pens comprise the EDPs. Sixty-four of the WDPs were removed in 1975 during construction of the Cellular Biology Laboratory (WA, 2000b).

In addition to being fed/injected with radioactive materials, dogs were reportedly dipped in chlordane to control fleas from 1960 until 1968. Chlordane was also sprayed in and around the Dog Pens, particularly near the southern edge of the pens because flea-bearing rodents were believed to be more plentiful south of the Dog Pens than in other directions due to the presence of Putah Creek to the south (Ballard, 1997). Chlordane use continued until the early 1970s (Dames & Moore, 1993).

From the 1940s through the mid-1960s, portions of the Site were used by UC Davis as campus landfills. Part of UC Davis' Landfill Disposal Unit 2, operated from 1956 through 1967, underlies the EDPs (Figure 2-1).

## 2.2 Removal Site Evaluation

### 2.2.1 Physical Location

The LEHR Site is located immediately east of Old Davis Road, just south of Interstate 80 in Solano County California, in the southeast quarter of Section 21, Township 8 North, Range 2 East, Mount Diablo Base and Meridian. It is approximately 1.5 miles south of the town of Davis (Figure 1-1), and occupies a portion of the UC Davis south campus.

The land within a one-mile radius of the Site is owned both privately and by the Regents of the University of California, and is used for animal research, agriculture and recreation. Immediately east, north and west of the Site are UC Davis-operated research facilities. Privately owned lands within one mile to the south and east of the Site include permanent residences and fields that support some crops. Approximately 75% of the surrounding land in the general vicinity of the Site is used for agriculture. Major crops include fruits, nuts and grains. The Site is located near Putah Creek, which is used for fishing and recreation.

### 2.2.2 Site Characteristics

UC Davis is currently using the LEHR Site for research activities, and plans to continue similar activities in the foreseeable future. The UC Davis Institute for Toxicology and Environmental Health (ITEH) occupies several former LEHR facilities. ITEH activities involve approximately 200 University researchers and support staff.

DOE has no present or planned future activities at the LEHR Site aside from environmental restoration and waste management activities. Site improvements originally completed by DOE will be transferred to UC Davis upon completion of any necessary environmental restoration associated with those structures, as described in the Memorandum of Agreement (MOA) between DOE and UC Davis (DOE, 1997).

The LEHR Federal Facility is operated by DOE and is a portion of the LEHR Site placed on the EPA's National Priorities List (NPL). DOE is responsible for conducting the non-time critical response operations proposed herein, as stipulated in the FFA (EPA, Region 9, et. al.).

### 2.2.3 Release or Threatened Release into the Environment of Hazardous Substance, or Pollutant, or Contaminant

The contamination in the gravel and concrete curbs in the Dog Pens is a result of the elimination of biological matter by the dogs housed in the pens. While the dog feces were removed from the pens daily (1958 Annual Progress Report, DOE), urine percolated into the gravel floor of

the Dog Pens (Ballard, 1997; Goldman, 1997; Hinz; DOE archived records). The gravel was removed periodically and replaced.

Calculations made by Rosa, Gielow and Peterson in the 1963 LEHR Annual Report (DOE archived records) indicated that the dogs were eliminating up to 0.23 microCuries ( $\mu\text{Ci}$ ) per 48 hours in feces and urine 28 days after Sr-90 exposure. Calculations by Goldman in a 1963 memorandum (DOE archived records) estimated that about 500 microCuries per year ( $\mu\text{Ci/yr}$ ) of Sr-90 and about 50  $\mu\text{Ci/yr}$  of Ra-226 were eliminated in urine by the dogs in the pens.

Hazardous substances, as defined by Section 101(14) of CERCLA, and pollutants or contaminants as defined by Section 101(33) of CERCLA, present at the Site include Sr-90, Ra-226, pesticides and metals. Tables 2-1 list the pollutants found in the gravel and concrete curbs at the WDPs and EDPs.

Statistical evaluation of the WDPs and EDPs soil data collected after the Site was added to the NPL indicate all contaminants of potential concern (COPCs) are at or below the appropriate soil target levels defined as the lowest appropriate risk-based action standards (RBASs), or background concentrations for those COPCs with background levels higher than the lowest RBAS (see Section 3 of the EE/CA). The RBAS selected was the *lowest* RBAS derived for the following three potential exposure scenarios:

- Scenario 1: On-site Researcher—This scenario is consistent with the UC Davis long-range plan to continue research activities at the Site.
- Scenario 2: Eastside Residential Farmer—This scenario assumes a residential farmer is located immediately east of the 1997 UC Davis property boundary. This scenario represents the nearest reasonable downgradient (with respect to ground water) location for a potential off-site receptor.
- Scenario 3: South Side Residential Farmer—This scenario assumes a residential farm is located immediately south of the UC Davis property boundary and Putah Creek. This location represents the nearest reasonable downwind location for an off-site receptor.

In addition, many of the WDPs soil sample locations were selected specifically to target areas that were suspected to have elevated COPC levels. Accordingly, use of these data in the statistical analysis and comparisons with RBASs yields results that are more health-conservative than a random sample set.

Radionuclide and metals levels in the Dog Pens gravel are generally similar to those in background soils; however, no gravel-specific background levels have been determined. To properly evaluate the gravel background concentration, several gravel samples must be collected off site and analyzed to calculate gravel-specific background levels. Also, the existing laboratory results are for total gravel analyses, and may not represent potentially elevated surface levels. Therefore, existing gravel data are not sufficient to support a no-removal decision. Similarly, conclusions about the concrete curbing contamination cannot be drawn without additional sampling due to the limited data set. Given the need to remove the gravel and concrete curbs to allow beneficial use of the

property, the most efficient approach is to remove these materials. Final disposition of these materials will be based on future characterization results.

A ground water impact evaluation (WA, 2000c) indicated that above-background constituents in the shallow WDPs and EDPs soil will not impact underlying ground water. Thus, no removal action is required to address potential future ground water impacts from these constituents.

#### *2.2.4 National Priorities List Status*

This Site was placed on the NPL on May 31, 1994, with both DOE and UC Davis named as Potentially Responsible Parties (PRPs) (59 Federal Register 27989). A 1997 MOA between DOE and UC Davis delineates each PRP's area of responsibility. The FFA, Administrative Docket Number 99-17 (EPA, Region 9, et al.) defines the scope of DOE's responsibilities for RAs at the Site.

#### *2.2.5 Maps, Pictures, and Other Geographic Representations*

All graphical representations pertinent to the RAs are presented in the EE/CA. Site location and Dog Pens RA maps are included in this memorandum as Figures 1-1 and 2-1, respectively.

### **2.3 Other Actions To Date**

#### *2.3.1 Previous Actions*

Over the past eight years, numerous expedited cleanup and source RAs have been successfully completed at the Site. In 1995/1996 above-ground structures, including pedestals, barrels and sheds, were removed from the Dog Pens. In 1996, approximately 111 cubic yards (cu yds) of low-level radioactive waste were removed from the Site under a CERCLA time-critical RA. An estimated 450 cu yds of hazardous waste and 873 cu yds of low-level radioactive waste were removed under a non-time-critical RA in the Southwest Trenches and an additional 2,400 cu yds of low-level radioactive waste were removed during a non-time critical Radium/Strontium Treatment Systems RA (WA, 2000a). An RA for the Domestic Septic Systems is scheduled for 2001 (WA, 2000a). In addition, UC Davis has conducted and continues to conduct environmental restoration activities for its areas of responsibility as outlined in the MOA between DOE and UC Davis (DOE, 1997). Non-CERCLA DOE site cleanup activities include decontamination of four on-site buildings, removal of a cobalt-60 irradiator facility and closure of a RCRA-permitted mixed waste storage facility. The Dog Pens EE/CA summarizes the more significant Site restoration actions accomplished or planned.

### *2.3.2 Current and Planned Actions*

Currently, waste from previously completed RAs is being shipped off site (WA, 2000a) and an RA for the Domestic Septic Systems is scheduled for 2001 (WA, 2000a).

## **2.4 State and Local Authorities' Roles**

### *2.4.1 State and Local Actions to Date*

Site investigation began in 1984 under the oversight of CVRWQCB. After the Site's listing on the NPL in 1994, environmental investigation and cleanup oversight responsibility was transferred to the EPA with input from the DTSC, DHS, and CVRWQCB.

### *2.4.2 Potential for Continued State/Local Response*

No State or local response actions are anticipated other than continued oversight of site cleanup activities under CERCLA. DOE will provide the necessary funding and support for the Dog Pens RAs and future monitoring and maintenance.

Table 2-1. Summary of Analytic Results for the Concrete Curb and Gravel Samples from the Former Western and Eastern Dog Pens Investigations

| Constituent                            | Radiation Survey Results | Pens Sampled   | Units | No. of Samples Analyzed | No. of Samples Above Detection Limit <sup>(1)</sup> | Min Activity/Conc <sup>(2)</sup> | Max Activity/Conc   | Average Activity/Conc <sup>(3)</sup> |
|--|--------------------------|----------------|-------|-------------------------|---|----------------------------------|---------------------|--------------------------------------|
| <b>Eastern Dog Pens Curb Samples</b>   |                          |                |       |                         |   |                                  |                     |                                      |
| Radium-226                             | Bkgd                     | <sup>(5)</sup> | pCi/g | 3                       | 3   | 0.269                            | 0.96                | 0.519                                |
| Radium-226                             | Elevated                 | <sup>(6)</sup> | pCi/g | 3                       | 3   | 0.354                            | 1.68                | 0.872                                |
| Strontium-90                           | Bkgd                     | <sup>(5)</sup> | pCi/g | 3                       | 1   | <0.05                            | 1.59 <sup>(4)</sup> | 0.805                                |
| Strontium-90                           | Elevated                 | <sup>(6)</sup> | pCi/g | 3                       | 2   | 0.398 <sup>(4)</sup>             | 7.44 <sup>(4)</sup> | 3.13                                 |
| <b>Western Dog Pens Curb Samples</b>   |                          |                |       |                         |   |                                  |                     |                                      |
| Radium-226                             | N/A                      | <sup>(7)</sup> | pCi/g | 7                       | 7   | 0.255                            | 3.67                | 1.46                                 |
| Strontium-90                           | N/A                      | <sup>(7)</sup> | pCi/g | 7                       | 6   | 0.025                            | 3.29                | 0.80                                 |
| <b>Eastern Dog Pens Gravel Samples</b> |                          |                |       |                         |   |                                  |                     |                                      |
| Radium-226                             | N/A                      | NL             | pCi/g | 16                      | 16  | 0.196                            | 0.396               | 0.291                                |
| Strontium-90                           | N/A                      | NL             | pCi/g | 16                      | 2   | 0.0324                           | 0.201               | 0.029                                |
| <b>Western Dog Pens Gravel Samples</b> |                          |                |       |                         |   |                                  |                     |                                      |
| Radium-226                             | N/A                      | NL             | pCi/g | 46                      | 38  | 0.086                            | 1.94                | 0.625                                |
| Strontium-90                           | N/A                      | NL             | pCi/g | 46                      | 4   | 0.009                            | 3.59                | 0.363                                |
| Uranium-238                            | N/A                      | NL             | pCi/g | 46                      | 15  | 0.058                            | 1.20                | 0.438                                |



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Table 2-1. Summary of Analytic Results for the Concrete Curb and Gravel Samples from the Former Western and Eastern Dog Pens Investigations (continued)

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**Notes:**

- <sup>(1)</sup> Number of samples above reporting limit represents the number of samples greater than the “detection units” for volatile and semi-volatile organic compounds, pesticides, the instrument detection limit for metals, the minimum detection limit for general chemistry, and the minimum detectable activity for radionuclides.
- <sup>(2)</sup> Minimum value above the laboratory’s reported lower limit of detection.
- <sup>(3)</sup> The average of all detected concentrations including concentrations below the reporting limit. If the sample results were below the detection limit, half the detection limit was used to calculate the average.
- <sup>(4)</sup> Average of two analytic results for the same sample.
- <sup>(5)</sup> M-31, between M-30 and M-31, and between L-5 and L-4.
- <sup>(6)</sup> Between M-30 and M-31, between M-31 and M-32, and between L-2 and L-3.
- <sup>(7)</sup> C-32, between E-1 and F-3, F-30, between H-31 and H-32, between H-32 and I-1, and between I-1 and I-2.

**Abbreviations:**

|       |                     |
|-------|---------------------|
| Bkgd  | Background          |
| Conc  | Concentration       |
| Min   | Minimum             |
| Max   | Maximum             |
| N/A   | Not applicable      |
| NL    | Not listed          |
| pCi/g | picoCuries per gram |

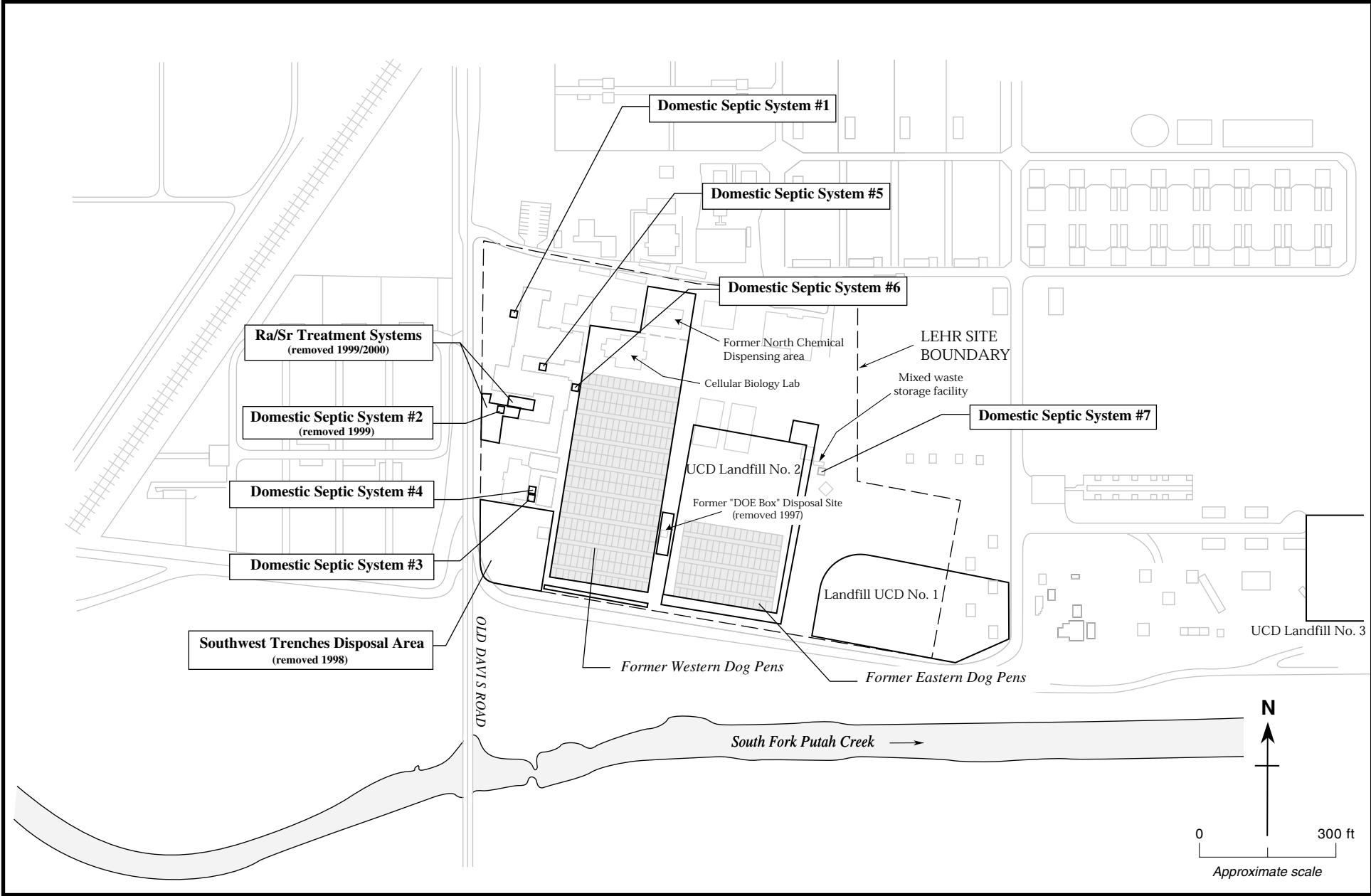


Figure 2-1. Location of Western and Eastern Dog Pens, LEHR Site, UC Davis, California

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### **3. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES**

#### **3.1 Threats to Public Health or Welfare**

The U.S. EPA (EPA, 1991) indicates that where the cumulative potential carcinogenic risk to an individual based on reasonable maximum exposure from both current and future land uses is less than  $10^{-4}$  and the Hazard Index (HI) is  $<1$ , remedial action is generally not warranted unless there are adverse environmental impacts. In the case where water is delivered to any user of a public water system where the maximum contaminant levels (MCLs) or non-zero MCL goals are exceeded, action is generally warranted. The EPA  $10^{-4}$  to  $10^{-6}$  risk range is a target within which risk should be managed as part of a cleanup action. Once a decision has been made to undertake cleanup, the preference is to achieve the more protective end of the range (i.e.,  $10^{-6}$ ).

RBAS values have been calculated for the soils in the Dog Pens and are presented in the EE/CA. The residual contaminant levels in the Dog Pens soils are below the applicable RBAS values.

RBAS values have not been defined for gravel, concrete and asphalt. The existing data are not sufficient to support a no-removal decision because they cannot support a determination of no public and environmental exposure greater than applicable regulatory thresholds.

The RAs discussed in this Action Memorandum are intended to provide a remedy which eliminates or controls the threat posed by residual waste in the Dog Pens. A site-wide Record of Decision (ROD), to be completed in 2004, will evaluate the effectiveness of these RAs, and determine if additional action or controls are necessary.

#### ***3.1.1 Criteria for Determining the Existence of Threats to Public Health or Welfare***

In accordance with the NCP, the following criteria must be considered in determining the appropriateness of a non-time-critical RA (40 CFR, Section 300.415) to address threats to public welfare or the environment.

Criterion (i) *Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations*: Contaminant concentrations in gravel and concrete curbs may

result in a greater than  $10^{-4}$  excess cancer risk for exposed on-site personnel if the RAs are not completed.

Criterion (ii) *Actual or potential contamination of drinking water supplies*: Ground water monitoring data indicate that no significant impact to ground water drinking supplies has occurred from the removal sites.

Criterion (iii) *Hazardous substances or pollutants or contaminants in drums, barrels, tanks or other bulk storage containers*: None.

Criterion (iv) *High levels of hazardous substances or pollutants or contamination in soils, largely at or near the surface*: The contaminant concentrations in the gravel near the surface may result in a greater than  $10^{-4}$  excess cancer risk for exposed on-site personnel if the RAs are not completed.

Criterion (v) *Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released*: Rainwater infiltration from potentially contaminated gravel and concrete into soil may encourage downward migration of contaminants. High winds may generate pesticide-bearing and/or radioactive dust.

Criterion (vi) *Threat of fire or explosion*: None.

Criterion (vii) *The availability of other appropriate Federal or State responses to respond to the release*: None.

Criterion (viii) *Other situations or factors that may pose threats to public health or welfare or the environment*: Long-term building occupancy in the vicinity of the Dog Pens could result in unacceptable exposure to hazardous substances and/or ionizing radiation.

### 3.2 Threats to the Environment

Because of the relatively long half-lives (i.e. greater than 1,000 years) of some of the radionuclides present in the Dog Pens, future threats to the environment from contaminants in the gravel and concrete curbs in the Dog Pens may include animal and/or food chain exposure to contaminants, contamination of nearby ecosystems, and migration of pollutants into surface waters, groundwater, and air or consequent contamination of those media. However, available data suggests that the environmental resources have not been significantly affected. Additional data will become available after 2004 when a Site-wide risk assessment (including ecological risks) will be completed.

### *3.2.1 Animal and Food Chain Risks*

Threats to animal and food chain receptors from pollutants or contaminants in the Dog Pens have not been studied in sufficient detail to allow positive conclusion about the presence and/or extent of potential risks. A site-wide ecological risk assessment will be completed in conjunction with the Remedial Investigation / Feasibility Study in 2004 (EPA, Region 9). An exposure pathway analysis for animals and the food chain was conducted in 1997 and is available in the *Draft Final Ecological Scoping Assessment for DOE Areas for the U.S. Department of Energy-Related Health Research* (WA, 1997b). This assessment was conducted for the entire LEHR site and indicated that potentially complete exposure pathways exist at the Site whereby biological receptors may be exposed to contaminated media based on the available characterization data. However, the presence of complete pathways by which biological receptors may be exposed to contaminated media is not necessarily equivalent to the presence of significant risk or hazard to these receptors.

A potential habitat for the Valley Elderberry Longhorn Beetle (*Besmnocerus californicus dimorphus*), listed as a threatened species under the Endangered Species Act (10 U.S.C. 1536 (c)), is present in the WDPs. The United States Fish and Wildlife Service has agreed with DOE's determination that no adverse effect to the species will result from the proposed removal actions.

### *3.2.2 Threats to Surface Waters and Sensitive Ecosystems*

The South Fork of Putah Creek is identified as wetlands by United States Army Corps of Engineers (USACE). Wetlands perform vital ecological functions, including providing habitat, breeding, spawning and forage areas for a variety of resident and migratory animal species, allowing the movement of water and sediments, and providing ground water recharge, water purification, and storage of stormwater runoff.

Surface water samples are collected by UC Davis from two sampling points in Putah Creek—one located upstream from the Site and one located downstream. These data, while valuable, do not allow full evaluation of the impacts from DOE Areas on Putah Creek surface water since they reflect in-stream contaminant levels that may have many sources other than the DOE areas. Under typical storm conditions, it is unlikely that contamination is carried from the Dog Pens to Putah Creek via surface runoff because runoff from Dog Pen areas ponds locally and infiltrates into Site soil or evaporates.

### *3.2.3 Threats to Ground Water*

A ground water impact evaluation (WA, 2000c) indicated that potentially above-background constituents in the WDPs and EDPs soil will not impact underlying ground water above the ground water goals. The ground water goals are the EPA or DHS Maximum Contaminant Levels (MCLs) for drinking water or more stringent state water quality goals which are determined to be applicable or

relevant in the Record of Decision. Based on these evaluations, no RAs are needed for WDPs or EDPs soil.

#### *3.2.4 Threats to Air Quality*

Analytical results of a one-year baseline air sampling investigation indicate that the observed average and maximum activities of total alpha and total beta radiation levels at the Site are predominantly the result of natural sources and worldwide fallout. Air monitoring data confirm that detectable levels of gamma-emitting radionuclides at the Site are in compliance with 40 CFR Part 61 Subpart H requirements, and that small detectable levels are likely associated with background sources (PNNL, 1996).

Analytical results for non-radiological pollutants indicate that detectable concentrations of metals were found in ambient air at both the Site and distant stations located approximately six miles northwest of the Site and unaffected by Site operations. Average pesticide air concentrations at on-site stations were similar to the distant station, with no statistical differences compared to the distant station. The air concentrations for the majority of VOCs were below the detection limits.

## 4. ENDANGERMENT ASSESSMENT

Actual or threatened releases of hazardous substances/pollutants and contaminants from this site, if not addressed by implementing the response actions selected in this Action Memorandum, may present a future endangerment to public health, welfare, or the environment.

If no action is taken, residual levels of radionuclides will remain in the WDPs and EDPs for more than 1,000 years. Potential future exposure to the public and the environment could occur if the WDPs contamination is not removed or controlled. However, short-term impacts are unlikely if the Site remains in its current state of use and management because access is limited to UC Davis employees and researchers. Surface water quality and stormwater discharge may be impacted if no action is taken.

## **5. EXEMPTION FROM STATUTORY LIMITS**

Because the RAs will be performed and funded by DOE, they are not subject to the Superfund-financed cost limitations of 12 months and \$2 million prescribed in 40 CFR Section 300.415(a)(5).



## 6. PROPOSED ACTIONS AND ESTIMATED COSTS

### 6.1 Proposed Actions

The specific removal action objectives (RAOs) for the proposed Dog Pens RAs are developed in the EE/CA (Section 4) and are listed below:

- Mitigate potential excess cumulative cancer risk to an individual from exposure to Site contaminants to a level within a nominal range of  $10^{-4}$  to  $10^{-6}$ , using  $10^{-6}$  as the point of departure;
- Reduce potential non-cancer HIs to levels below 1;
- Mitigate potential impact to ground water;
- Mitigate potential ecological risks during and after the RAs;
- Minimize impact to Site university research; and,
- Facilitate UC Davis' remediation of the landfill underlying the EDPs.

#### 6.1.1 Proposed Action Description

Site-specific RBASs which correlate with the cancer risk and non-cancer risk RAOs were developed for the Dog Pens (WA, 1997c). The RBASs are listed in Section 2 and detailed in Section 3 of the EE/CA. The proposed actions are designed to meet the RBASs.

**Recommended Removal Action for the Western Dog Pens:** The recommended alternative for the WDPs is Alternative 3 listed in the EE/CA: remove concrete, gravel and asphalt and dispose of all waste off site (EE/CA, Section 7.1). This alternative was chosen because it achieves RAOs and limits the degree of uncertainty related to the volume of soil that needs to be excavated. With the physical removal of Dog Pens structures, almost three acres of land will be available for future beneficial use, and the potential for public and environmental exposure to residual levels of radionuclides will be eliminated. This alternative complies with all Applicable or Relevant and Appropriate Requirements (ARARs).

Although Alternative 3 is the most expensive, it has a defined endpoint and no recurring annual costs. The uncertainty associated with potential human and environmental exposure from leaving the contaminants in place will be eliminated when the waste is removed and disposed.

The planned sequence of RA activities and associated assumptions are summarized below, and will be discussed in detail in the RA Work Plan.

Under the selected alternative, all gravel, concrete curbs and asphalt will be characterized, excavated, segregated and disposed. Following waste removal, confirmation samples will be collected for Ra-226, Sr-90 and chlordane analyses based on an approved statistical-based sampling plan. Assumptions regarding this RA include:

- The excavation limits and the locations of confirmation samples are documented on a land survey after all waste is removed;
- Excavations are backfilled and compacted with clean fill material from an off-site source that is known to be uncontaminated;
- Existing features (i.e., fences, trees, monitoring wells, structures and underground utilities) are protected during the RA or restored to their original condition at the end of the RA;
- Gamma spectroscopy and other high-resolution detectors are used in the field to delineate radiologically-impacted concrete;
- Composite samples are collected (either before or after waste removal) to characterize low-level waste and potentially releasable material (per DOE Order 5400.5 and National Council on Radiation Protection and Measurements Report No. 116);
- No hazardous or mixed waste is generated;
- Regulatory approval is granted for disposition of releasable material at a sanitary landfill;
- All waste is disposed at EPA-approved facilities;
- Waste is either pre-characterized and direct-loaded into re-usable containers for immediate disposal or stockpiled and managed pending characterization;
- Confirmation sample locations are based on a random grid generated with the statistical approach used in previous LEHR RA;
- Institutional controls are applied if confirmatory samples indicate unacceptable residual risk for unrestricted land use; and,
- Land use covenants will be required if future risk assessment indicates a residential exposure exceeding applicable statutes and regulations.

***Recommended Removal Action for Eastern Dog Pens:*** The recommended alternative for the EDPs is Alternative 2 in the EE/CA: implement institutional controls (EE/CA, Section 7.2). Under this alternative, administrative and physical controls will restrict land use pending the remediation of the underlying landfill, which is expected to occur within the next five years. As long as the landfill remains in its current state, institutional controls will be required. Long-term enforcement of institutional controls would require vigilance from local regulatory bodies.

Semi-annual inspections and periodic site maintenance are routine practices already used for managing the Site. However, any resulting loss of land use will be the subject of future negotiations between DOE and UC Davis. The uncertainty associated with the potential exposure resulting from contaminants left in place is low, given that the performance period for this action is limited until the Final ROD is implemented.

The institutional controls associated with this proposed action are summarized below, and will be discussed in detail in the RA Work Plan:

- Perimeter fences around all the pens to prevent public access to impacted areas;
- Permanent postings to prevent unsupervised subsurface soil disturbance;
- Site monitoring to verify that contaminants have not migrated and that the Site remains in a safe and stable condition; and,
- Enforcement of land use restrictions to control access.

#### *6.1.2 Contribution to Remedial Performance*

The selected RAs are intended to provide an effective final remedial action for the WDPs. The effectiveness of the selected alternative for the EDPs is contingent upon an agreement with UC Davis regarding clean up of the underlying landfill. A ROD for the DOE areas will be prepared in 2004, after both DOE and UC Davis have completed the remediation work. The ROD will evaluate the RAs performed under this Action Memorandum and previous RAs to determine whether additional action is necessary.

#### *6.1.3 Description of Alternative Technologies*

Table 6-1 summarizes the remedial technologies evaluated in the EE/CA based on effectiveness, implementability, and cost. Additional information is provided in the EE/CA.

#### *6.1.4 Engineering Evaluation/Cost Analysis*

The Draft Final EE/CA was submitted to the overseeing regulatory agencies and the public on November 30, 2000. The release of the EE/CA was advertised in three local newspapers, and a fact sheet describing the proposed RAs was prepared and distributed for comment to the parties on the Site mailing list. No comments were received from the public during the 45-day comment period which ended January 15, 2001.

The Draft Final EE/CA was approved by the Remedial Project Managers team with minor modifications to two pages based on an internal comment from UC Davis. These pages have been

revised, and submitted to all recipients of the Draft Final EE/CA on January 30, 2001. The Draft Final version along with the revised pages will be considered the Final EE/CA.

#### *6.1.5 Applicable or Relevant and Appropriate Requirements*

Potential ARARs for CERCLA sites fall into three broad categories based on the chemicals of concern, the site location and conditions, and the RA being considered. These categories are Action-Specific, Location-Specific, and Chemical-Specific. Federal, State and local requirements in each category are listed and reviewed in Section 4 of the EE/CA and are provided in Tables 6-2 through 6-4. These ARARs, along with risk evaluation data, potential ground water impacts and other considerations, were used to develop the RAOs.

#### *6.1.6 National Environmental Policy Act*

The National Environmental Policy Act (NEPA) requires an assessment of potential impacts that may result from implementing a proposed RA. Section 8 of the EE/CA reviews environmental impacts in a manner that is consistent with NEPA and with DOE environmental compliance guidelines.

Review of probable environmental impacts from the RA alternatives indicated that, for the most part, the RAs will impact a relatively small area of previously-disturbed land, and the proposed activities would have little effect on the environment. The EE/CA concluded that no long-term, significant, and adverse environmental impacts are likely from any of the proposed activities.

#### *6.1.7 Project Schedule*

A general RA schedule is presented below in Table 6-5.

Table 6-5. Planned LEHR Dog Pens Removal Action Schedule

| Activity                          | Quarter                              |
|-----------------------------------|--------------------------------------|
| Prepare Removal Action Work Plans | First quarter of 2001                |
| Field Work                        |                                      |
| Western Dog Pens Removal Action   | Second through fourth quarters, 2001 |
| Confirmation Sampling             | Third through fourth quarters, 2001  |
| Eastern Dog Pens Access Controls  | Fourth quarter, 2001                 |
| Off-site Disposal of Waste        | Fourth quarter, 2002                 |
| Dog Pens Confirmation Report      | First quarter, 2002 (2/15/02)        |

## **6.2 Estimated Costs**

The total estimated cost for the two selected actions is \$2,967,000: \$2,800,000 for the WDPs RA and \$167,000 for EDPs institutional controls. Additional cost information is presented in Section 5 of the EE/CA.

Table 6-1. LEHR Dog Pens Remedial Technology Screening Summary

| Technology                | Description  | Effectiveness | Implementability | Cost     | Screening Status/<br>Comments  |
|---------------------------|--|---------------|------------------|----------|--|
| No Action                 | Continue to maintain the Site without further remedial action.               | Moderate      | High             | Low      | Retained per National Contingency Plan guidance.   |
| Natural Attenuation       | Natural site conditions degrade and/or restrict movement of contaminants.    | Low           | High             | Low      | Not retained. The decay time for radioactive isotopes to reach acceptable risk levels would likely exceed 1,000 years. Natural site conditions are likely inadequate for restricting contaminant mobility. |
| Legal Controls            | Limit future development and site use through deed restrictions.             | Moderate      | High             | Moderate | Retained. Effective for preventing human exposure to contaminants by limiting land use and site disturbance from excavation or other construction activities. Requires long-term enforcement.              |
| Contaminant Monitoring    | Monitor contaminant levels, radiation levels and dust/contaminant migration. | High          | High             | Moderate | Retained. Necessary for documenting changing conditions and ensuring contaminant containment.  |
| Administrative Monitoring | Ensure institutional controls are maintained and site use is controlled.     | High          | High             | Low      | Retained. Required to ensure continued use of institutional controls.  |

Table 6-1. LEHR Dog Pens Remedial Technology Screening Summary (continued)

| Technology          | Description  | Effectiveness | Implementability | Cost     | Screening Status/<br>Comments  |
|---------------------|--|---------------|------------------|----------|--|
| Physical Controls   | Install perimeter fence to restrict access and prevent exposure.                                       | High          | High             | Low      | Retained. Limits human access and exposure that may result from site disturbance. Effectiveness depends on the rigor of site monitoring and maintenance.                     |
| Permeable Surfacing | Place soil, gravel or pavement to function as a barrier to prevent human exposure to underlying soils. | Low/Moderate  | High             | Moderate | Not retained. Protects against above-surface exposure only; does not restrict subsurface contaminant mobility.   |
| Excavation          | Remove all or part of contaminated gravel, concrete and asphalt.                                       | High          | High             | Moderate | Retained. Contaminants are physically removed, which eliminates further migration through soil. Dust control is required during this activity to prevent airborne migration. |
| Waste Segregation   | Physically segregate excavated waste by waste stream prior to disposal.                                | High          | High             | Low      | Retained. Waste is categorized for efficient handling and disposal. Effectiveness and implementability depend on the accuracy of the waste characterization.                 |

Table 6-1. LEHR Dog Pens Remedial Technology Screening Summary (continued)

| Technology              | Description   | Effectiveness | Implementability | Cost          | Screening Status/<br>Comments   |
|-------------------------|---|---------------|------------------|---------------|---|
| LLW Disposal            | Dispose waste at a DOE-approved LLW disposal facility.                      | High          | High             | Moderate/High | Retained. Although expensive to ship and dispose, radionuclide mobility is restricted through disposal in an engineered facility.   |
| Sanitary Waste Disposal | Dispose waste at a licensed and permitted sanitary landfill.                | High          | High             | Moderate      | Retained. Sanitary waste can be disposed locally at a moderate expense.   |
| Cap                     | Consolidate waste and engineer an on-site RCRA cap to contain contaminants. | High          | Low/Moderate     | Moderate/High | Not retained. Restricts land use.   |
| Landfill                | Construct a new RCRA landfill for waste disposal.                           | High          | Low              | High          | Not retained. Contaminant mobility is limited through disposal in an engineered facility. However, implementation is unlikely due to the lengthy design and permitting process. |

**Abbreviations:**

DOE U.S. Department of Energy  
 LLW Low-Level Waste  
 RCRA Resource Conservation and Recovery Act



Table 6-2. Chemical-Specific Requirements for the LEHR Facility

| Requirement/Authority  | Comments  | ARAR Category            |
|--|---|--------------------------|
| <b>Federal</b>   |   |                          |
| Solid Waste Disposal Act, Resource Conservation and Recovery Act, (42 USC §6921, 40 CFR Part 261)  | Requires identification and listing of hazardous waste. If waste is listed in 40 CFR 261 or tested according to specified test methods or by applying knowledge of the hazardous characteristics of the waste, and the waste is determined to be hazardous, compliance with 40 CFR 262, Standards Applicable to Generators of Hazardous Waste, is required. | Applicable               |
| Clean Water Act (33 USCA 1251-1376, 40 CFR 122, 125, 136)  | Both on-site and off-site discharges from CERCLA sites to surface waters are required to meet substantive Clean Water Act limitations, monitoring requirements and best management practices.   | Applicable               |
| Safe Drinking Water Act (42 USCA 300 and 40 CFR 141.11-16, 141.50-51)  | Establishes MCLs as health-based standards and MCLGs as health goals for public water supply systems. The LEHR site is not a public water supply system. However, this requirement is relevant and appropriate.   | Relevant and Appropriate |
| Establishment of Cleanup Levels at CERCLA Sites with Radioactive Contamination (EPA, 1997, OSWER Directive No. 9200.4-18)                  | Cleanup should generally achieve a carcinogenic risk within the $1 \times 10^{-4}$ to $1 \times 10^{-6}$ range based on the reasonable maximum exposure for an individual. A specific risk estimate near $1 \times 10^{-4}$ may be considered acceptable if justified based on site-specific conditions.  | To Be Considered         |
| Supplemental Information on the Implementation of the Final Rule on Radiological Criteria for License Termination, 64 FR 234, Dec. 7, 1999 | Provides screening values for surface soil contamination release levels and information on NRC dose modeling. Supplements the NRC Final Rule on Radiological Criteria for License Termination 62 FR 39058 July 21, 1997. Surface soil screening values equivalent to 25 mrem/y are provided for Strontium-90 and Radium-226.                                | To Be Considered         |
| <b>State and Local</b>   |   |                          |
| Criteria for Identifying Hazardous Wastes (CCR, Title 22, 66261. 21-33)  | Tests for identifying hazardous characteristics are set forth in these regulations. If a chemical is either listed or tested and found hazardous, then remedial actions must comply with the applicable CCR Title 22 requirements.  | Applicable               |

Table 6-2. Chemical-Specific Requirements for the LEHR Facility (continued)

| Requirement/Authority   | Comments   | ARAR Category |
|---|--|---------------|
| Porter-Cologne Water Quality Control Act (California Water Code, Div. 7, § 13000, et. seq. and 23 CCR Chap. 15, 2510-2559, 2580-2601)   | Establishes authority for state and regional water boards to determine site-specific waste discharge requirements and to regulate disposal of waste to land. Contains corrective action requirements stating that a COC not exceed background values unless it is technically or economically infeasible, in which case the default clean-up values would be the Basin Plan Water Quality Objectives.  | Applicable    |
| Central Valley Regional Water Quality Control Board Basin Plan, "Policy for Investigation and Cleanup of Contaminated Sites" and "Policy for Application of Water Quality Objectives" | <p>Describes water basins in the Central Valley Region, establishes beneficial uses of ground and surface waters, establishes water quality objectives and numerical standards, establishes implementation plans to meet water quality objectives and protect beneficial uses, and incorporates statewide water quality control plans and policies. Any activity, including, but not limited to, the discharge of contaminated soils or waters, or <i>in-situ</i> treatment or containment of contaminated soils or waters, must not result in actual water quality exceeding water quality objectives.</p> <p>The "Policy for Investigation and Cleanup of Contaminated Sites" establishes and describes policy for investigation and remediation of contaminated sites. Also includes implementation actions for setting ground water and soil cleanup levels. Cleanup levels for soils should be equal to levels that would achieve background concentrations in ground water unless such levels are technically and economically infeasible to achieve. In such cases, soil cleanup levels are such that ground water will not exceed applicable ground water quality objectives.</p> <p>"Policy for Application of Water Quality Objectives" defines water quality objectives and explains how the Regional Water Board applies numerical and narrative water quality objectives to ensure the reasonable protection of beneficial uses of water and how the Regional Water Board applies Resolution No. 68-16 to promote the maintenance of existing high quality waters. Applies to all cleanups of discharges that may affect water quality.</p> | Applicable    |

Table 6-2. Chemical-Specific Requirements for the LEHR Facility (continued)

| Requirement/Authority  | Comments   | ARAR Category                         |
|--|--|---------------------------------------|
| State Water Resources Control Board Resolution No. 68-16, "Anti-degradation Policy"          | Requires that high quality surface and ground waters be maintained to the maximum extent possible. Degradation of waters will be allowed (or allowed to remain) only if it is consistent with the maximum benefit to the people of the State, does not unreasonably affect present and anticipated beneficial uses, and does not result in water quality less than that prescribed in RWQCB and SWRCB policies, as defined by the substantive requirements. If degradation is allowed, the discharge must meet best practicable treatment or control, which must prevent pollution or nuisance and result in the highest water quality consistent with maximum benefit to the people of the state. | Applicable                            |
| State Water Resources Control Board Resolution No. 92-49 (as amended April 21, 1994)         | Establishes requirements for investigation and cleanup and abatement of discharges. Among other requirements, dischargers must clean up and abate the effects of discharges in a manner that promotes the attainment of either background water quality, or the best water quality that is reasonable if background water quality cannot be restored. Requires the application of Title 23, CCR, Section 2550.4, requirements to cleanups.   | Relevant and Appropriate <sup>1</sup> |
| State Water Resources Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" | Specifies that, with certain exceptions, all ground and surface water have the beneficial use of municipal or domestic water supply. Applies in determining beneficial uses for water that may be affected by discharges of waste. SWRCB Resolution 88-63 applies to all sites that may be affected by discharges of waste to ground water or surface water. The resolution specifies that, with certain exceptions, all ground water and surface water have the beneficial use of municipal use or domestic supply. Consequently, California State primary MCLs are relevant and appropriate; however, the most stringent federal or state standard will be the ARAR for the removal action.      | Applicable                            |

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Table 6-2. Chemical-Specific Requirements for the LEHR Facility (continued)

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**Notes:**

- 1 The following standard is set forth in Title 22 CCR Section 66264.94, Title 22 CCR Section 66265.94, Title 23 CCR Section 2550.4, and SWRCB Res. No. 92-49 Section III G:  
“Concentration limits for a constituent of concern greater than background values for that constituent can be established only if it is demonstrated that it is technologically or economically possible to achieve the background value for that constituent; in no event shall a concentration limit greater than background for a constituent of concern exceed the lowest concentration that is technologically or economically achievable.” The U.S. Department of Energy reserves their position that this standard is a Federal ARAR via its incorporation in Title 22 CCR Section 66264.94 which was federally authorized via EPA’s authorization of the State of California RCRA program.

**Abbreviations and Acronyms:**

|        |  |
|--------|--|
| ARAR   | Applicable or Relevant and Appropriate Requirement                           |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act of 1980 |
| COC    | Chemical of Concern  |
| EPA    | U.S. Environmental Protection Agency   |
| FR     | Federal Register   |
| MCLGs  | Maximum Contaminant Level Goals  |
| MCLs   | Maximum Contaminant Levels   |
| mrem/y | millirem per year  |
| NRC    | Nuclear Regulatory Commission  |
| RCRA   | Resource Conservation and Recovery Act                                       |
| RWQCB  | Regional Water Quality Control Board   |
| SWRCB  | State Water Resources Control Board  |

Table 6-3. Location-Specific Requirements for the LEHR Facility

| Requirement/Authority  | Comments  | ARAR Category |
|--|---|---------------|
| <b>Federal</b>   |   |               |
| Endangered Species Act of 1973 (16 USC § 1531 et seq., 50 CFR Parts 10, 11, 17, 200, 402, & 424, and 40 CFR 257.3)                       | Facilities or practices shall not cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife. Activities will be evaluated to determine their impact on listed species and species proposed for listing and their habitat. If jeopardy or adverse modification will result from any site activities, a determination will be made based on a consultation with the USFWS regarding the need for mitigation measures and/or an incidental take statement. Specific mitigation measures will be identified and implemented per USFWS guidelines.  | Applicable    |
| Executive Order 11988 (floodplain management) and 11990 (protection of wetlands) (40 CFR 6, 10 CFR 1022)                                 | Directs all Federal agencies to avoid, if possible, development and other activities in the 100-year base floodplain. Where the base floodplain cannot be avoided, special considerations and studies for new facilities and structures are needed. Design and siting are to be based on scientific, engineering, and architectural studies; consideration of human life, natural processes, and cultural resources; and the planned lifespan of the project. Federal agencies are required to: 1) reduce the risk of flood loss; 2) minimize the impact of floods on human safety, health, and welfare, and 3) restore and preserve the natural and beneficial values served by floodplains in carrying out agency responsibility. 44 Federal Register 12594 states that DOE can meet requirements of these Executive Orders through applicable DOE and NEPA procedures. | Applicable    |
| National Historic Preservation Act of 1966 (16 USC 470 et seq., Public Law 89-665 and amendments of 1980, Public Law 96-515, 36 CFR 800) | Requires federal agencies to take into account the effects of their projects on historic properties listed, or eligible for listing, on the National Register of Historic Properties and to afford the Advisory Council a reasonable opportunity to comment on them.  | Applicable    |
| Fish and Wildlife Coordination Act (16 USC 661-666)  | Requires action to preserve endangered species or threatened species. Prior to conducting any ground disturbing activities, surveys will be conducted for species of concern.   | Applicable    |

Table 6-3. Location-Specific Requirements for the LEHR Facility (continued)

| Requirement/Authority  | Comments  | ARAR<br>Category |
|--|---|------------------|
| <b>State And Local</b>   |   |                  |
| California Endangered Species Act (California Fish and Game Code, § 2050–2068) | Requires action to preserve endangered species or threatened species. Prior to conducting any ground-disturbing activities, surveys will be conducted for species of concern. | Applicable       |

**Abbreviations:**

NEPA National Environmental Policy Act  
USFWS U.S. Fish and Wildlife Service

Table 6-4. Action-Specific Requirements for the LEHR Facility

| Requirement  | Comments   | ARAR Category            |
|--|--|--------------------------|
| <b>Federal</b>   |  |                          |
| Clean Water Act § 404 (33USC 1344, 33CFR 328 and 40 CFR 230)   | Establishes a national program to control the discharge of dredged or fill materials into “waters of the United States”. “Waters of the United States” is defined to include all tributaries of navigable waters and nearly all wetlands. Although no permit would be required for actions affecting a wetland, the substantive provisions of Section 404, including agency coordination prior to construction, state water quality certification, and possibly even mitigation for loss, may be applicable. These requirements may apply if RAs cause turbid water to enter drainages, or if RAs impact wetlands adjacent to Putah Creek. | Applicable               |
| National Pollution Discharge Elimination System (40 CFR Parts 122, 123, 124, implemented by State Water Resources Control Board Order No. 92-08 DWQ) | Regulates pollutants in discharge to stormwater associated with construction activities (clearing, grubbing, or excavation) involving the disturbance of five acres or more. Ensures stormwater discharges do not contribute to a violation of surface water quality standards. Includes measures to minimize and/or eliminate pollutants in stormwater discharges and monitoring to demonstrate compliance. The Dog Pens RA will not disturb five acres or more. However, this requirement is relevant and appropriate.   | Relevant and Appropriate |
| National Emissions Standards for Hazardous Air Pollutants (42USC 7401-7671, 40 CFR 61, Subparts H)   | Emissions of radionuclides from any U.S. Department of Energy (DOE) facility to the ambient air shall not exceed levels that would result in an effective dose equivalent of 10 millirem per year (mrem/yr). Dust generated from excavation activities would be subject to this requirement.   | Applicable               |
| Federal Facilities Compliance Act of 1992, (PL 102-386)  | This act amends the Solid Waste Disposal Act and states that all federal agencies are subject to all substantive and procedural requirements of federal, state, and local solid and hazardous waste laws in the same manner as any private party.  | Applicable               |
| 10 CFR 835 Occupation Radiation Protection   | Provides for the protection of radiation workers at DOE facilities. Includes dose limits and requirements to reduce the dose to levels that are ALARA.   | Applicable               |
| Radioactive Waste Management (DOE Order 435.1)   | Specifies requirements for managing DOE radioactive waste, including off-site disposal requirements for radioactive waste shipped to commercial facilities. Although not promulgated standards, these requirements constitute requirements for protection of the public with which the proposed action would comply.   | Applicable               |

Table 6-4. Action-Specific Requirements for the LEHR Facility (continued)

| Requirement   | Comments  | ARAR Category            |
|---|---|--------------------------|
| Radiation Protection of the Public and the Environment (DOE Order 5400.5)                         | This Order establishes requirements for DOE facilities and operations for control of radiation exposure to the public. Although not promulgated standards, the DOE Order requirements were developed for protection of the public and the environment and are mandatory requirements for DOE activities. Chapter I adopts the International Commission on Radiological Protection recommendation that radiation dose to individuals be based on consideration of levels that are ALARA. Chapter II establishes DOE public dose limit for all exposure modes and DOE sources of radiation of 100 mrem/yr effective dose equivalent. The public dose limit specifically applies to remedial actions. This radiation dose limit also forms the basis for the release of radionuclides to the environment and the release of properties for unrestricted use discussed in Chapter IV. | Applicable               |
| Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978 (40 CFR 204, 205, 211) | Construction and transportation equipment noise levels (e.g., portable air compressors, and medium and heavy trucks), process equipment noise levels, and noise levels at the property boundaries of the project are regulated under this Act. State or local agencies typically enforce these levels.  | Applicable               |
| Standards for Protection Against Radiation (10 CFR 20. Subparts B, C & E)                         | DOE activities conducted at LEHR are not subject to the NRC's licensing requirements. However, DOE policy articulated in DOE Order 5400.5 is to adopt and implement standards generally consistent with those of the NRC for DOE facilities and activities not subject to licensing authority. The NRC standards for radiation protection and occupational exposure dose limits are in Subparts B and C. Subpart E defines radiological criteria for unrestricted use of sites with residual radioactivity.   | Relevant and Appropriate |
| Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61)                         | Establishes requirements for radiation protection, access restrictions, future impacts, siting, drainage, final cover, buffer zones, ground water monitoring and waste disposal requirements.   | Relevant and Appropriate |



Table 6-4. Action-Specific Requirements for the LEHR Facility (continued)

| Requirement   | Comments  | ARAR Category |
|---|---|---------------|
| <b>State and Local</b>  |   |               |
| Yolo-Solano Air Quality Management District Rules and Regulations, Rule 2.3, Ringlemann Chart                   | Establishes a permissible limit on visible emissions (Ringlemann Chart) resulting from construction activities, such as soil disturbance during a RA.   | Applicable    |
| Prohibited Acts (Health and Safety Code § 41700)  | Prevents discharge of pollutants into the air that will cause injury, detriment, nuisance, or annoyance to any considerable number of persons or the public. Regulation applicable to construction activities during RAs.   | Applicable    |
| Control of Radioactive Contamination in the Environment (California Health and Safety Code, § 114705, et. seq.) | Details administration of programs of surveillance and control of those activities that could lead to the introduction of radioactive materials into the environment. Applicable unless activity is governed by DOE statutory authority.  | Applicable    |
| Radiation Control Law (California Health and Safety Code, § 114960, et. seq.)                                   | Institutes and maintains a regulatory program for sources of ionizing radiation so as to provide for compatibility with standards and regulatory programs of the federal government and an integrated system within the state. Applicable unless activity is governed by DOE statutory authority. | Applicable    |
| State Department of Health Service Radiation Regulations (17 CCR, Chapter 5, Subchapter 4, § 30100, et. seq.)   | Presents regulations of the Department of Health Services pertaining to radiation such as standards for protection against radiation, low-level radioactive waste disposal, and transportation regulations. Applicable unless activity is governed by DOE statutory authority or regulation.      | Applicable    |

**Abbreviations and Acronyms:**

|         |  |
|---------|--|
| ALARA   | As-Low-As-Reasonably-Achievable                    |
| ARAR    | Applicable or Relevant and Appropriate Requirement |
| DOE     | U.S. Department of Energy                          |
| LEHR    | Laboratory for Energy-Related Health Research      |
| mrem/yr | millirem per year                                  |
| NRC     | Nuclear Regulatory Commission                      |
| RA      | Removal Action                                     |

## **7. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN**

If the proposed RAs are delayed or not taken, residual contamination will limit beneficial use of the WDPs and increase DOE's overall management and cleanup costs for the Site.

## **8. OUTSTANDING POLICY ISSUES**

None.

## 9. ENFORCEMENT

The RAs are governed by the FFA, Administrative Docket Number 99-17, In the Matter of The U.S. Department of Energy, Laboratory for Energy-Related Health Research (LEHR) (EPA, Region 9, et. al.), entered into by the following parties:

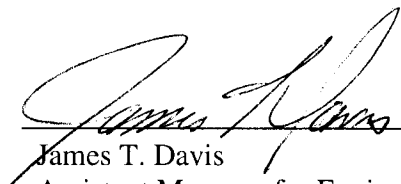
- United States Environmental Protection Agency, Region 9;
- Central Valley Regional Water Quality Control Board;
- California Department of Health Services;
- California Department of Toxic Substances Control; and,
- United States Department of Energy.

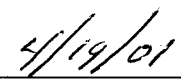
## 10. RECOMMENDATION

This decision document describes the selected RAs for the Dog Pens at the LEHR Federal facility in Davis, California, developed in accordance with CERCLA as amended, and is consistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site meet the NCP Section 300.415(b)(2) criteria for a removal. The estimated total cost for the RA is \$2,967,000, which will be funded by DOE.

The undersigned approves implementation of the selected RAs for the Dog Pens at the LEHR Site.

  
\_\_\_\_\_  
James T. Davis  
Assistant Manager for Environment and Nuclear Energy  
Oakland Operations Office  
U.S. Department of Energy

  
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Date

## 11. REFERENCES

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